

CLAIMS

1. A liquid crystal display device having a liquid crystal material with spontaneous polarization sealed between a common electrode and a plurality of pixel electrodes, and switching elements provided to correspond with said plurality of pixel electrodes, respectively, comprising

an applying unit for applying voltage of same polarity to said liquid crystal material through said switching elements a plurality of times continuously within one period.

2. The liquid crystal display device of claim 1, wherein the voltages applied to said liquid crystal material by the plurality of times of voltage application are equal in magnitude.

3. The liquid crystal display device of claim 1, wherein at least two voltages among the voltages applied to said liquid crystal material by the plurality of times of voltage application are different in magnitude.

4. The liquid crystal display device of claim 3, wherein a magnitude of the voltage applied for the $(n+1)$ th (n : natural number) time is not less than a magnitude of the voltage applied for the n th time.

5. The liquid crystal display device of claim 3, wherein a magnitude of the voltage applied for the $(n+1)$ th (n : natural number) time is not less than a magnitude of the voltage of said liquid crystal material just before the $(n+1)$ th application of voltage after the n th application of voltage.

6. The liquid crystal display device of claim 1, wherein a combination of magnitude of voltages to be applied to said liquid crystal material a plurality of times is set so as to display a predetermined grayscale level.

7. The liquid crystal display device of claim 6, wherein a greater number of grayscales are displayed compared to the number of output grayscales of said applying unit.

8. The liquid crystal display device of claim 6, wherein, if the number of times of application of voltage of same polarity to said liquid crystal material within one period is N times (N : natural number), lowest grayscale levels are displayed by the N th application of voltage, higher grayscale levels than the grayscale levels displayed by the N th application of voltage are sequentially displayed by a combination of the J th ($2 \leq j \leq N$) through N th applications of voltage, and highest grayscale levels are displayed by a combination of the 1st through N th applications of voltage.

9. The liquid crystal display device of claim 1, wherein, after applying voltages of same polarity to said liquid crystal material a plurality of times, said applying unit applies reverse voltages, which are reversed in polarity and equal in magnitude with respect to said applied voltages, to said liquid crystal material the same number of times as the plurality of times.

10. The liquid crystal display device of claim 9, wherein, the order of magnitude of the reverse voltages is opposite to the order of magnitude of the voltages of same polarity.

11. The liquid crystal display device of claim 9, wherein, a back-light is turned off in synchronism with an end of the first application of the reverse voltage.

12. A liquid crystal display device having a liquid crystal material with spontaneous polarization sealed between a common electrode and a plurality of pixel electrodes, and switching elements provided to correspond with said plurality of pixel electrodes, respectively, comprising

a switching unit for switching between a first mode in which voltage of same polarity is applied to said liquid crystal material through said switching elements a plurality of times continuously within one period and a second mode in which voltage

of same polarity is applied to said liquid crystal material through said switching elements once within the one period.

13. The liquid crystal display device of claim 12, wherein said switching unit switches between the first mode and the second mode, based on temperature.

14. The liquid crystal display device of claim 1, wherein said liquid crystal material is a ferroelectric liquid crystal material.

15. The liquid crystal display device of claim 1, comprising a light source for emitting at least light of three primary colors, wherein a color display is performed by switching the colors of light emitted by said light source in a time-divided manner in synchronism with on/off driving of said switching elements.

16. The liquid crystal display device of claim 1, comprising: a light source for emitting white light; and color filters in a plurality of colors, wherein a color display is performed by selectively transmitting the emitted light from said light source through said color filters.

17. The liquid crystal display device of claim 12, wherein

said liquid crystal material is a ferroelectric liquid crystal material.

18. The liquid crystal display device of claim 12, comprising a light source for emitting at least light of three primary colors,

wherein a color display is performed by switching the colors of light emitted by said light source in a time-divided manner in synchronism with on/off driving of said switching elements.

19. The liquid crystal display device of claim 12, comprising:

a light source for emitting white light; and
color filters in a plurality of colors,

wherein a color display is performed by selectively transmitting the emitted light from said light source through said color filters.